REMARKS/ARGUMENTS

Request for Continued Examination:

The applicant respectfully requests continued examination of the above-indicated application as per 37 CFR 1.114.

Claims 1-4, 8, 11-12, 14-15, 17, 20, 25 and 27-28 remain in this application. Claims 5-7, 9-10, 13, 16, 18-19, 21-24 and 26 have been cancelled without prejudice. Claims 27-28 are newly added without entering any new matters.

The Examiner is thanked for the thorough examination of the present application. Claims 1-4, 8-9 and 11-26, however, were rejected under 35 U.S.C. 103(a). Applicants have made amendments to the claims and thereby respectfully request reconsideration of the remaining claims for at least the reasons set forth herein.

Response to the claim rejections:

Claims 1, 11-12, 14-15, 17 and 20 were rejected under 35 U.S.C. 103(a) as being unpatentable over Jones (U.S. Patent No. 6,873,279) in view of Kuo (U.S. Patent No. 7,145,968). Applicants respectfully assert that these claims are patentable over the cited references for at least the following reasons.

Regarding claim 1, the amended claim 1 recites:

> A signal processing device for processing a received signal to generate a sliced signal, comprising:

an equalizer for generating an equalized signal according to the received signal;

a multilevel quantizer, coupled to the equalizer, for **utilizing X threshold/thresholds to quantize the equalized signal to thereby output the sliced signal being one of at least X+1 predetermined levels when a first mode is adopted**, and **utilizing Y thresholds to quantize the equalized signal to thereby output the sliced signal being one of at least Y+1 predetermined levels when a second mode is adopted**, wherein the X and the Y are positive integers, **the Y is more than the X**, and **the at least Y+1 predetermined levels are more than the at least X+1 predetermined levels**; and

a control logic for adopting one of the first mode and the second mode by executing the following steps:

adopting the first mode and then **comparing the equalized signal with the sliced signal which is the one of the at least X+1 predetermined levels for obtaining a first difference** and **comparing the equalized signal with a predetermined value which is different from any of the sliced signal and the X threshold/thresholds for obtaining a second difference**;

adopting the second mode instead of the first mode when the first difference and the second difference together indicate an unreliable status; and

adopting the first mode when the first difference and the second difference together indicate a reliable status.

(*Clear Version with Emphasis Added*)

In which the multilevel quantizer utilizes the threshold/thresholds to quantize the equalized signal to thereby output the sliced signal being one of a plurality of predetermined levels. It is therefore clearly shown that **the threshold is distinguished from the predetermined level**. With this clarification, the feature of the claimed

multilevel quantizer is well-understood through the following claim limitations: "utilizing X threshold/thresholds to quantize the equalized signal to thereby output the sliced signal being one of at least X+1 predetermined levels when a first mode is adopted, and utilizing Y thresholds to quantize the equalized signal to thereby output the sliced signal being one of at least Y+1 predetermined levels when a second mode is adopted, wherein the X and the Y are positive integers, the Y is more than the X, and the at least Y+1 predetermined levels are more than the at least X+1 predetermined levels". That is, the multilevel quantizer utilizes **different quantities of thresholds** (i.e. the X threshold/thresholds and the Y thresholds) to quantize the equalized signal to thereby output the sliced signal being one of the **different quantities of the predetermined levels** (i.e. the at least X+1 and the at least Y+1 predetermined levels) when **different modes** (i.e. the first and the second modes) **are adopted**. For example, the present specification describes that "[I]n normal slice mode (i.e. the first mode), there is only one predetermined threshold, i.e. 0 (i.e. the X threshold). This means that when the received signal is larger than 0, the sliced signal is 1, and when the received signal is less than 0, the sliced signal is –1…there are three thresholds 0.66, 0, ~0.66 (i.e. the Y thresholds) in the multiple slice mode (i.e. the second mode). When the received signal is larger than 0.66, the sliced signal is 1, when the received signal is between 0.66 and 0, the sliced signal is 0.33, when the received signal is between 0 and –0.66, the sliced signal is –0.33, and when the received signal is less than –0.66, the sliced signal is –1…" (*Paragraphs [0014] and [0015] of the specification*).

Furthermore, the claimed control logic is responsible for adopting one of the first and the second modes by executing the following steps: "adopting the first mode and then comparing the equalized signal with the sliced signal which is the one of the at least X+1 predetermined levels for obtaining a first difference and comparing the equalized signal with a predetermined value which is different from any of the sliced signal and the X threshold/thresholds for obtaining a second difference; adopting the second mode instead of the first mode when the first difference and the second

<u>difference together indicate an unreliable status; and adopting the first mode when the first difference and the second difference together indicate a reliable status</u>". The comparing step for obtaining the first and second differences can be realized through an embodiment of the stop-and-go decision described in the present specification. The stop-and-go decision compares "the equalized signal received by the quantizer 240" with "a predetermined level of the sliced signal outputted by the quantizer 240" and compares "the equalized signal" with "a value resulting from a constant modulus algorithm" (*Paragraph [0018] of the specification*). Assume that the predetermined levels (i.e. the at least X+1 predetermined levels) are 1 and –1 in normal slice mode (i.e. the first mode) and the value (i.e. the predetermined value which is different from any of the sliced signal and the X threshold/thresholds) resulting from the constant modulus algorithm is 0.7 (*Paragraph [0018] of the specification*). If the equalized signal is 0.8, it is then quantized to be a sliced signal being the predetermined level 1 and consequently the difference (i.e. the first difference) between the equalized signal 0.8 and the predetermined level 1 is "0.2" and the difference (i.e. the second difference) between the equalized signal 0.8 and the predetermined value 0.7 is "–0.1" (*Paragraph [0018] of the specification*). Since the two differences "0.2" and "–0.1" have different signs (i.e. together indicate an unreliable status), the multiple slice mode (i.e. the second mode) is thereby adopted (*Paragraph [0018] in view of the last six lines of paragraph [0017] of the specification*).

Accordingly, **the claimed invention teaches that the multilevel quantizer utilizes different quantities of thresholds** (i.e. the X threshold/thresholds and the Y thresholds) **to quantize the equalized signal to thereby output the sliced signal being one of the different quantities of predetermined levels** (i.e. the at least X+1 predetermined levels and the at least Y+1 predetermined levels, wherein the latter are more than the former) **when the control logic adopts different modes** (i.e. the first and the second modes) **by executing the claimed steps**. The cited references Jones and Kuo, however, do NOT disclose the claimed multilevel quantizer, the claimed control logic and the relation between them.

Regarding Jones, Jones at most discloses using variables MAX0, MIN1, MAX1 and MIN2 to **update the threshold values T_{0-1} and T_{1-2}** (*Jones: col. 2, lines 17-31; col. 2, lines 32-48; col. 2, lines 49-65; col. 3, lines 18-57; col. 3, line 64 – col. 4, line 18; col. 4, lines 26-42; col. 4, lines 50-56*), but is silent on utilizing different quantities of thresholds to quantize an equalized signal to thereby output a sliced signal being one of the different quantities of predetermined levels when different modes are adopted. Although the threshold values T_{0-1} and T_{1-2} of Jones might function as the claimed X thresholds, **the variables MAX0, MIN1, MAX1 and MIN2 do NOT work like the claimed Y thresholds in function and purpose** (where Y is more than X according to claim 1). Jones expressly describes that "<u>[T]he MIN-N value and the MAX-M values are configured to change over time based on the prior received input signals and existing MIN-N and MAX-M values. In this manner, changes in the input signal that occur over time may be accounted for, and **the threshold value, which is dependent upon the MIN and MAX values, may be dynamically modified to adapt to changes in the input signal**</u>." (*Jones: col. 8, lines 11-18; Figs. 3A and 3B*). This description clearly demonstrate**s that the variables MAX0, MIN1, MAX1 and MIN2 are used for updating the threshold values T_{0-1} and T_{1-2} but themselves are NOT threshold values for quantizing**.

Besides, even though the threshold values T_{0-1} and T_{1-2} and the variables MAX0, MIN1, MAX1 and MIN 2 could be viewed as the claimed X and Y thresholds respectively, the claimed X threshold/thresholds results in a sliced signal being one of the at least X+1 predetermined levels and the claimed Y thresholds results in a sliced signal being one of the at least Y+1 predetermined levels (**where the at least Y+1 predetermined levels are more than the at least X+1 predetermined levels according to claim 1**) while the threshold values T_{0-1} and T_{1-2} of Jones result a sliced signal being one of the 3 levels (i.e. 0, 1 and 2) but **the variables MAX0, MIN1, MAX1 and MIN 2 of Jones do NOT result in a sliced signal being one of the levels MORE THAN the above-mentioned 3 levels**. Accordingly, Jones fails to discloses

utilizing different quantities of thresholds to quantize an equalized signal to thereby output a sliced signal being one of the different quantities of predetermined levels when different modes are adopted. Though Kuo discloses two threshold values, i.e. DC+threshold and DC̃threshold, which result in three levels, i.e. positive, zero and negative (*Kuo: col. 4, lines 29-47; fig. 4*), **Kuo is still silent on the claimed limitations of utilizing different quantities of thresholds to quantize an equalized signal to thereby output a sliced signal being one of the different quantities of predetermined levels when different modes are adopted** and accordingly Kuo fails to compensate for the deficiencies of Jones.

Moreover, Jones does NOT teach or suggest the claimed control logic for adopting one of the first and second modes by executing the claimed steps. Neither does Kuo.

The claimed control logic adopts one of the first and the second modes by executing the steps of "adopting the first mode and then comparing the equalized signal with the sliced signal which is the one of the at least X+1 predetermined levels for obtaining a first difference and comparing the equalized signal with a predetermined value which is different from any of the sliced signal and the X threshold/thresholds for obtaining a second difference; adopting the second mode instead of the first mode when the first difference and the second difference together indicate an unreliable status; and adopting the first mode when the first difference and the second difference together indicate a reliable status". Kuo at most teaches that a digital signal is quantized to a level of "zero" when the digital signal is smaller than a threshold, the digital signal is quantized to a "positive" level when the digital signal is larger than "DC+threshold", and the digital signal is quantized to a "negative" level when the digital signal is smaller than "DC-threshold" (*Kuo: col. 4, lines 40-47; Fig. 4*), but **nowhere teaches or suggests comparing the digital signal with the SLICED SIGNAL** (not the thresholds DC+threshold and DC̃threshold) **which is one of the "zero" level, the "positive" level and the "negative" level for obtaining a first**

difference and **comparing the digital signal with a predetermined value which is DIFFERENT FROM any of the sliced signal** (i.e., one of the "zero" level, the "positive" level and the "negative" level) **and the thresholds** (i.e. DC+threshold and DC̃threshold) **for obtaining a second difference**. Consequently, Kuo never teaches the step of **adopting a second mode instead of a first mode when the first difference and the second difference together indicate an unreliable status** and the step of **adopting the first mode when the first difference and the second difference together indicate a reliable status**. To sum up, **neither Jones nor Kuo teaches or suggests the claimed control logic for adopting one of the first and second modes by executing the specific claimed steps**.

For at least the fore-mentioned reasons, Jones in view of Kuo does NOT teach or suggest the amended claim 1. Applicants therefore respectfully assert that the amended claim 1 is placed in condition of allowance. Since claim 11 is dependent upon claim 1, if claim 1 is found to be allowable, so too should the dependent claim.

Regarding claim 12, the amended claim 12 recites:

A signal processing device for generating a sliced signal according to a received signal, comprising:

an equalizer for generating an equalized signal according to the received signal;

a quantizer, coupled to the equalizer, for **utilizing X threshold/thresholds to quantize the equalized signal to thereby output the sliced signal being one of at least X+1 predetermined levels when a first mode is adopted**, and **utilizing Y thresholds to quantize the equalized signal to thereby output the sliced signal being one of at least Y+1 predetermined levels when a second mode is adopted,** wherein the X and the Y are positive integers, **the Y is more than the X**, and **the at least Y+1 predetermined levels are more than the at least X+1**

predetermined levels; and

a control logic for adopting one of the first mode and the second mode by executing the following steps:

adopting the first mode and then comparing the equalized signal with the sliced signal which is the one of the at least X+1 predetermined levels for obtaining a first difference and **comparing the first difference with a predetermined threshold which is different from any of the sliced signal and the X threshold/thresholds**;

adopting the second mode instead of the first mode when the first difference is larger than the predetermined threshold; and

adopting the first mode when the first difference is smaller than the predetermined threshold.

(*Clear Version with Emphasis Added*)

Please note that the control logic of claim 12 executes the steps different from that of claim 1. The control logic of claim 12 executes the following steps: "<u>adopting the first mode and then comparing the equalized signal with the sliced signal which is the one of the at least X+1 predetermined levels for obtaining a first difference and **comparing the first difference with a predetermined threshold** which is different from any of the sliced signal and the X threshold/thresholds; **adopting the second mode instead of the first mode when the first difference is larger than the predetermined threshold**; and **adopting the first mode when the first difference is smaller than the predetermined threshold**</u>". In which the comparing step can be realized through an embodiment of the error decision described in the present specification. The error decision compares "the equalized signal received by the quantizer 240" with "a predetermined level of the sliced signal outputted by the

quantizer 240" for obtaining a difference (i.e. the first difference) and then determines whether the difference is larger or less than a predetermined threshold (*Paragraph [0017] of the specification*). Assume that the predetermined levels (i.e. the at least X+1 predetermined levels) are 1 and –1 (which are separated by a threshold 0) in normal slice mode (i.e. the first mode) and the predetermined threshold is "0.5" (*Paragraph [0017] of the specification*). If the equalized signal is 0.3, it is then quantized to be a sliced signal being the predetermined level 1 and thus the difference (i.e. the first difference) between the equalized signal 0.3 and the predetermined level 1 is "0.7" (*Paragraph [0017] of the specification*). As a result, the difference "0.7" is compared with the predetermined threshold "0.5" and then found to be larger than the predetermined threshold "0.5". Therefore, the multiple slice mode (i.e. the second mode) is adopted (*Paragraph [0017] of the specification*).

Accordingly, **the invention of claim 12 teaches that the quantizer utilizes different quantities of thresholds** (i.e. the X threshold/thresholds and the Y thresholds) **to quantize the equalized signal to thereby output the sliced signal being one of the different quantities of predetermined levels** (i.e. the at least X+1 predetermined levels and the at least Y+1 predetermined levels, wherein the latter are more than the former) **when the control logic adopts different modes** (i.e. the first and the second modes) **by executing the claimed steps**. The cited references Jones and Kuo, however, do NOT disclose the claimed quantizer, the claimed control logic and the relation between them.

Regarding Jones in view of Kuo, Jones in view of Kuo fails to disclose the quantizer of claim 12 because of the same reasons for the multilevel quantizer of claim 1. Besides, Jones does not teach or suggest the control logic of claim 12. Neither

does Kuo.

The control logic of claim 12 adopts one of the first and the second modes by executing the steps of "adopting the first mode and then comparing the equalized signal with the sliced signal which is the one of the at least X+1 predetermined levels for obtaining a first difference and comparing the first difference with a predetermined threshold which is different from any of the sliced signal and the X threshold/thresholds; adopting the second mode instead of the first mode when the first difference is larger than the predetermined threshold; and adopting the first mode when the first difference is smaller than the predetermined threshold". Kuo at most teaches that a digital signal is quantized to a level of "zero" when the digital signal is smaller than a threshold, the digital signal is quantized to a "positive" level when the digital signal is larger than "DC+threshold", and the digital signal is quantized to a "negative" level when the digital signal is smaller than "DC̃threshold" (*Kuo: col. 4, lines 40-47; Fig. 4*), but **nowhere teaches or suggests comparing the digital signal with the SLICED SIGNAL** (not the thresholds DC+threshold and DC̃threshold) **which is one of the "zero" level, the "positive" level and the "negative" level for obtaining a first difference** and **comparing the digital signal with a predetermined threshold which is DIFFERENT FROM any of the sliced signal** (i.e. one of the "zero" level, the "positive" level and the "negative" level) **and the thresholds** (i.e. DC+threshold and DC̃threshold). Hence, Kuo never teaches the steps of **adopting a second mode instead of a first mode when the above-mentioned first difference is larger than the predetermined threshold** and **adopting the first mode when the above-mentioned first difference is smaller than the predetermined threshold**. Please remember that the first and second modes of claim 12 correspond to different quantities of thresholds respectively (i.e. the X threshold/thresholds and the Y thresholds) and result in the sliced signal being one of the different quantities of predetermined levels respectively (i.e. at least X+1 predetermined levels and the at least Y+1 predetermined levels, wherein the at least Y+1 predetermined levels are more than the at least X+1 predetermined levels). Therefore, **neither Jones nor Kuo**

teaches or suggests the claimed control logic for adopting one of the first and second modes by executing the specific claimed steps.

For at least the fore-mentioned reasons, Jones in view of Kuo does not teach or suggest the amended claim 12. Applicants therefore respectfully assert that the amended claim 12 is placed in condition of allowance. Since claims 14-15 are dependent upon claim 12, if claim 12 is found to be allowable, so too should the dependent claims.

Regarding claim 17, the amended claim 17 recites:

> A signal processing method for generating a sliced signal according to a received signal, comprising:
>
> generating an equalized signal according to the received signal;
>
> **utilizing X threshold/thresholds to quantize the equalized signal to thereby output the sliced signal being one of at least X+1 predetermined levels when a first mode is adopted**;
>
> **utilizing Y thresholds to quantize the equalized signal to thereby output the sliced signal being one of at least Y+1 predetermined levels when a second mode is adopted, wherein the X and the Y are positive integers, the Y is more than the X, and the at least Y+1 predetermined levels are more than the at least X+1 predetermined levels**;
>
> adopting the first mode and then **subtracting the equalized signal from the sliced signal which is the one of the at least X+1 predetermined levels for obtaining a first difference** and **comparing the first difference with a predetermined threshold which is different from any of the sliced signal and the X threshold/thresholds**;
>
> **adopting the second mode instead of the first mode when the first difference is larger than the predetermined threshold**; and

adopting the first mode when the first difference is smaller than the predetermined threshold.

(*Clear Version with Emphasis Added*)

Applicants respectfully assert that the amended claim 17 is patentable over Jones in view of Kuo for at least the same reasons placing claim 12 allowable. Besides, the method of claim 17 further executes the step of **SUBTRACTING** (not just comparing) the equalized signal from the sliced signal which is the one of the at least X+1 predetermined levels. This subtracting step is never found in Jones or Kuo. Kuo at most teaches that a digital signal is quantized to a level of "zero" when the digital signal is smaller than a threshold, the digital signal is quantized to a "positive" level when the digital signal is larger than "DC+threshold", and the digital signal is quantized to a "negative" level when the digital signal is smaller than "DC̃threshold" (*Kuo: col. 4, lines 40-47; Fig. 4*), but **nowhere teaches or suggests SUBTRACTING the digital signal from the SLICED SIGNAL** (not the thresholds DC+threshold and DC̃threshold) which is one of the "zero" level, the "positive" level and the "negative" level for obtaining a first difference. Therefore, the amended claim 17 is in condition of allowance. Since claim 20 is dependent upon claim 17, if claim 17 is found to be allowable, so too should the dependent claim.

Claim 2 was rejected under 35 U.S.C. 103(a) as being unpatentable over Jones in view of Kuo and further in view of Jayaraman (USPN 7,046,726), claims 3-4 were rejected under 35 U.S.C. 103(a) as being unpatentable over Jones in view of Kuo and

further in view of Strolle (USPN 5,799,037), claim 8 was rejected under 35 U.S.C. 103(a) as being unpatentable over Jones in view of Kuo and further in view of Samarasooriya (US 20010024479), and claim 25 was rejected under 35 U.S.C. 103(a) as being unpatentable over Jones in view of Kuo and further in view of Endres (USPN 6,668,014). Since these claims are dependent upon claims 1 and 17 respectively, applicants respectfully assert that they are allowable for at least the same reasons placing claims 1 and 17 in condition of allowance.

Claims 27-28 are newly added and dependent upon claim 1, and therefore asserted to be patentable for at least the same allowable reasons of claim 1.

Conclusion:

Therefore, all pending claims are submitted to be in condition of allowance. The Examiner is encouraged to telephone the undersigned if there are informalities that can be resolved in a phone conversation, or if the Examiner has any ideas or suggestions for further advancing the prosecution of this case.

Sincerely yours,

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